

18.0 SUICIDE




STATEMENT TO THE PUBLIC

Suicide

The reviewers used two distinct sets of guidelines to evaluate the evidence:

- Using the guidelines that the IARC uses to assess cancer risks, they considered the evidence as "inadequate" to implicate EMFs.
- Using the Guidelines developed especially for the California EMF Program, they all were "close to the dividing line between believing and not believing" that EMFs could increase the risk of suicide to any degree.

The reviewers graphed their degree of certainty as follows:

CONDITION	REVIEWER	IARC CLASS	CERTAINTY PHRASE	DEGREE OF CERTAINTY FOR POLICY ANALYSIS THAT AN AGENT (EMFs) INCREASES DISEASE RISK TO SOME DEGREE
Suicide	1	3	Close to dividing line	0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 
	2	3	Close to dividing line	
	3	3	Close to dividing line	

18.1 THE PATTERN OF EPIDEMIOLOGICAL EVIDENCE

Figure 18.1.1 Suicide

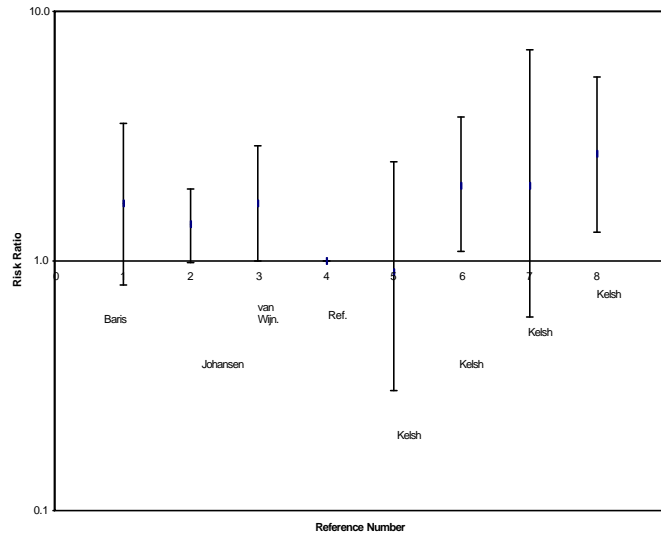


TABLE 18.1 KEY TO FIGURE 18.1.1

	EXPOSURE DEFINITION	REFERENCE NUMBER	INDIVIDUAL ODDS RATIO, MEAN	LOWER CL	UPPER CL
(Baris et al., 1996b)	<0.16 μ T vs. >0.16 μ T	1	1.70	0.80	3.60
(Johansen & Olsen, 1998a)	< 0.09 μ T vs. >1 μ T	2	1.40	0.98	1.94
(van Wijngaarden et al., 2000)	> 0.12 μ T yrs	3	1.70	1.00	2.90
(Kelsh, 1997)	Administration/technical	4	1.00	1.00	1.00
(Kelsh, 1997)	Management	5	0.90	0.30	2.50
(Kelsh, 1997)	Linemen	6	2.00	1.10	3.80
(Kelsh, 1997)	Meter readers	7	2.00	0.60	7.10
(Kelsh, 1997)	Plant operators	8	2.70	1.30	5.50

TABLE 18.1.2

REFERENCE	STUDY POPULATION	EXPOSURE METHOD	MAGNETIC FIELD EXPOSURES	CASES	OR (CI)
(Reichmanis et al., 1979)	Suicide victims and controls.	Estimates of residential exposure from power lines.		589	OR (not calculated) higher estimated and measured fields in cases' homes
(Perry, Reichmanis & Marino, 1981)	Suicide victims and controls.	Measurements in homes.			Higher measured fields
(McDowall, 1986)	Persons resident in vicinity of transmission lines in UK at time of 1971 census.	Home within 50 meters from substation or 30 meters from overhead line.		8	SMR = 0.75
(Baris & Armstrong, 1990)	Deaths in England and Wales during 1970-72 and 1979-83.	Job titles on death certificates. Electrical workers in aggregate as well as specific jobs. Proportional mortality study.	Job titles	495 suicide cases in electrical occupations	No increase for electrical workers.
(Johansen & Olsen, 1998a)	21,236 male employees in Danish utility companies observed during 1974-1993. There were 303,000 person-years of follow up. Cases: deaths from suicide in mortality registry.	Employment records and JEM: estimated average exposure level.	< 0.09 μ T 0.1-0.29 μ T 0.3-0.99 μ T > 1.0 μ T	21,236 males in cohort. 19 37 41 36	SMR = 1.0 SMR = 0.8 SMR = 0.9 SMR = 1.4
(Baris et al., 1996a)	21,744 Hydro Quebec male utility workers employed an average 12.9 years. Employed between 1970 and 1988. All circulatory disease deaths.	JEMs from 2,066 workweek EMF measurements (50/60 Hz magnetic and electric fields, pulsed EMF) applied to last job held. Also compared blue-collar and white-collar workers.	< 0.16 μ T vs. > 0.16 μ T < 5.76 volts/meter vs. > 5.76 <23.7 ppm vs. > 23.7 ppm	11 vs. 20 11 vs. 20 19 vs. 12	1.7 (0.8-3.6) 1.6 (0.8-3.4) 1.3 (0.6-2.8)
(Baris et al., 1996b)	Case subcohort. Study of 49 suicides and 217 subjects from (Baris, 1996a) cohort study.	JEMs from 2,066 workweek EMF measurements (50/60 Hz magnetic and electric fields, pulsed EMF) applied to last job held. Also compared blue-collar and white-collar workers.	V/M-yrs geom. mean <23 23-40	16 vs. 106 20 vs. 55	OR adjusted for SES, marriage and alcohol 1.0 3.1 (1.2-8.2)

REFERENCE	STUDY POPULATION	EXPOSURE METHOD	MAGNETIC FIELD EXPOSURES	CASES	OR (CI)
			40+ μT-yrs geom. mean < 1.25 1.25-2.1 > 2.1	13 vs. 54 26 vs. 107 8 vs. 54 15 vs. 54	2.2 (0.6-7.8) 1.0 1.3 (0.5-3.1) 1.9 (0.3-2.5)
(Kelsh, 1997)	Cohort mortality study. 40,335 Southern California Edison utility workers. Mortality determined from 1960-91. SMRs compared to general population and internal RR comparing other jobs to administrative staff. Tracked deaths for various endpoints, including suicide.	Assigned each subject to the job category that he or she had occupied for the longest time while working for the company.	Linemen Plant Operators Meter Readers Management Admin./Technical	Case/pers.- yr 22/111,189 13/46,942 3/19,900 5/61,639 18/211,925	2.0 (1.1-3.8) 2.7 (1.3- 5.5) 2.0 (0.6-7.1) 0.9 (0.3-2.5) Reference
(van Wijngaarden et al., 2000)	Cohort mortality study. 138,905 men employed for > 6 months in 5 electric utilities followed for mortality 1950-86. Deaths due to suicide.	Cumulative magnetic field exposure estimated from job history plus JEM based on 2,841 magnetic field measurements. JEM constructed for 28 occupational categories, collapsed into 5 exposure categories for TWA. "Recent exposures" shown here. Last 1-5 years also shows trend, but not past 10 to 20 or > 20 years.	0 μT-years 0-.029 .03-.049 .05-.11 > 0.12 Total	294 58 62 62 60 536	1.00 1.2 (0.8-1.9) 1.4 (0.9-2.3) 1.6 (1-2.7) 1.7 (1-2.9)

1 The reviewers reviewed eight epidemiological studies relating EMFs to suicide. The
2 figure shows the four occupational studies that carried out internal comparisons as
3 to magnetic fields or, in the case of Kelsh (Kelsh, 1997), job titles. In all these
4 studies, the rate in utility workers was lower than that of the general population, but
5 in all of them there was a pattern suggesting higher rates in the more highly
6 exposed jobs. Only in the very large van Wijngaarden (van Wijngaarden et al.,

7 2000) did this tendency nearly reach conventional statistical significance and display
8 a monotonic dose response. The binomial probability of four out of four studies with
9 ORs greater than 1.0 is 0.0625.

10 The discussion about bias and confounding in the occupational studies follows. The
11 residential studies, the reviewers agree, provide inadequate evidence.

18.2 ARGUMENTS FOR AND AGAINST CAUSALITY

TABLE 18.2.1

CHANCE		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) Most of these studies do not reach statistical significance and should be disregarded.	(F1) One should attend to the pattern for all the data.	(C1) The monotonic upward trend in association size with dose in van Wijngaarden is unlikely to be a chance event, nor are the job associations in Kelsh (Kelsh, 1997). The trends in the smaller Johansen (Johansen & Olsen, 1998a) and Baris (Baris et al., 1996b) studies then catch one's attention and make chance less likely.

TABLE 18.2.2

BIAS		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) There might be biases.	(F1) The only likely bias in these cohort studies is non-differential measurement error, which would tend to obscure associations.	(C1) Upward bias is probably not much of an issue in these studies.

TABLE 18.2.3

CONFOUNDING		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) The people who do the high-exposure jobs are very different from the low-exposure office and managerial staff. These associations are probably due to confounders.	(F1) One can speculate about confounding, but one should not dismiss an association until one has shown that it is due to confounding.	(C1) Since these studies could not control for well-known confounders and since the jobs ARE occupied by different kinds of people, confounding needs to be addressed. One should not assume, however, that confounders explain the association as a default and let the matter rest.
(A2) Even the highly exposed categories of workers have lower-than-average suicide rates and lower-than-average proportional mortality for suicide Baris (Baris & Armstrong, 1990).	(F2) Baris (Baris et al., 1996b) controlled for SES, alcohol, and marital status; and this strengthened the association between suicide and electric and magnetic fields. Electric fields reached conventional statistical significance with an OR of 3.1 (1.1-8.2). van Wijngaarden (van Wijngaarden et al., 2000) found that controlling for SES and location were not important.	(C2) As was the case with cancers and heart disease, utility workers, like other healthy workers, had lower-than-average suicide rates, but there is some evidence for differential suicide and depression rates for high- and low-EMF jobs.
(A3) Much of the association reported by van Wijngaarden (van Wijngaarden et al., 2000) derives from recently retired or laid-off workers, few of whom had recent exposure. The effect was stronger in one western utility company. There must be some confounding to explain this strange pattern.	(F3) The healthy-worker effect predictably will give lower suicide rates in employed populations because the mentally ill are usually not recruited to run power generation plants or maintain transmission lines. It is the difference in suicide rates in highly-exposed and unexposed workers that should command our attention.	
(A4) When Baris (Baris et al., 1996b) controlled for mental disease, the weak association with magnetic fields went away.	(F4) Mental disease (mostly depression) was associated with high magnetic field and electric field jobs in Baris (Baris et al., 1996b) OR = 1.7 (0.6-4.7). Baris recognized that EMFs may cause the depression and the suicide. Controlling for mental disease is probably inappropriate since it may be on the causal path to suicide.	

TABLE 18.2.4

STRENGTH OF ASSOCIATION		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) All of the reported associations are close enough to 1.0 to be easily explained by bias or confounding.	(F1) One should not ignore effects just because unspecified bias or confounding can be invoked.	(C1) Modest confounding could explain these associations.

TABLE 18.2.5

CONSISTENCY		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) There is only one study with statistically significant associations with estimated magnetic field, and its association is not much above 1.0.	(F1) If one flipped four coins 100 times, all four would come up heads only six times.	(C1) Of four utility worker studies with internal comparisons, four had risk ratios above 1.0. This is a consistency whose probability slightly misses the conventional (but arbitrary) benchmark for statistical significance.
(A2) With only three magnetic field studies and four studies, if one counts Kelsh's job title descriptions, this pattern is easily due to chance. A probability of 0.0625 is bigger than the conventional benchmark of 0.05 and thus easily due to chance.		

TABLE 18.2.6

HOMOGENEITY		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) Only one magnetic field study is statistically significant.	(F1) All three studies show effects close to $RR = 1.5$ for magnetic fields.	(C1) These large cohort studies with state-of-the-art exposure assessment show similar effects, but only the largest study had the power to achieve conventional statistical significance.
(A2) Johansen (Johansen & Olsen, 1998a) shows an association only at $1 \mu T$, while Baris (Baris et al., 1996b) and van Wijngaarden (van Wijngaarden et al., 2000) show associations at 0.12 - $0.16 \mu T$.	(F2) We may not have the power to resolve these differences.	(C2) The inconsistency of dose response does decrease confidence some.
(A3) Baris (Baris et al., 1996b) shows no associations with recent exposure, van Wijngaarden (van Wijngaarden et al., 2000) shows an association primarily with recent exposure.		
(A4) Baris (Baris et al., 1996b) shows little association with magnetic fields but shows an association with long-term electrical fields. This arises from multiple comparisons.		

TABLE 18.2.7

DOSE RESPONSE		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) Only van Wijngaarden (van Wijngaarden et al., 2000) shows dose response. Johansen (Johansen & Olsen, 1998a) had modest power but showed no dose response.	(F1) Johansen (Johansen & Olsen, 1998a) may not have had the power to show these associations, and it was an external, not internal, comparison.	(C1) There is some evidence for a monotonic dose response for magnetic fields but not electric fields.
	(F2) van Wijngaarden (van Wijngaarden et al., 2000) shows an orderly monotonic dose response for recent exposure.	
	(F3) Baris (Baris et al., 1996b) has a monotonic dose response for cumulative magnetic field exposure but not the statistical power to achieve significance.	

TABLE 18.2.8

COHERENCE/VISIBILITY		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) An epidemic of suicides should have been seen when electricity was introduced.	(F1) The association is modest and with fairly high exposures. This effect would not have been obvious in temporal trends.	(C1) The effect would not have been visible without targeted studies.

TABLE 18.2.9

EXPERIMENTAL EVIDENCE		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) The experimental evidence in humans and rodents for power frequency EMFs is mostly null.	(F1) Experiments may not have used the right aspect of the EMF mixture.	(C1) There have been no animal experiments on depression.
	(F2) Some experiments have suggested effects on sleep and behavior, and these are relevant to the nervous system and mood.	(C2) The experimental evidence for power frequency EMFs and melatonin is mostly non-supportive.
		(C3) Other experiments on behavioral endpoints are mildly supportive.

TABLE 18.2.10

PLAUSIBILITY		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) There is no demonstrated chain of causation from exposure to suicide.	(F1) There are some epidemiological studies suggesting an effect of the complete EMF mixture on melatonin (Wilson, Wright & Morris, 1990), (Burch et al., 1998), (Pfluger & Minder, 1996).	(C1) There is an established link between melatonin levels and depression, and the well-recognized increased risk of suicide in depressed persons. There is also some support, although not definitive, for the EMF mixture affecting melatonin in humans. Therefore, it is conceivable that EMF exposure could increase the risk of suicide.
(A2) McMahan (McMahan, Ericson & Meyer, 1994) and Verkasalo (Verkasalo et al., 1997) showed no association with mild depression. Savitz (Savitz, Boyle & Holmgreen, 1994) showed little association between depression and electrical occupation.	(F2) There are some epidemiological studies that suggest an association between the EMF mixture and depression (Poole et al., 1993); (Beale, 1998); (Bonhomme-Faivre et al., 1998a).	
	(F3) The healthy-worker effect may explain the Savitz (Savitz et al., 1994) findings. Savitz was not completely null in any case.	
	(F4) Melatonin has been used to predict the breast cancer/EMF association, too; and there is an overall association, at least for male breast cancer.	

TABLE 18.2.11

ANALOGY		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) There is no compelling analogy.	(F1) Seasonal affective disorder is thought to be due to light (another physical agent) and its effect on melatonin, among other possible mechanisms.	(C1) Not very influential to the reviewers.

TABLE 18.2.12

TEMPORALITY		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
See Generic Issues chapter.		

TABLE 18.2.13

SPECIFICITY		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
See Generic Issues chapter.		

TABLE 18.2.14

OTHER DISEASE ASSOCIATIONS		
AGAINST CAUSALITY	FOR CAUSALITY	COMMENT AND SUMMARY
(A1) The mechanisms of cancer, heart disease, ALS, and depression are quite different; shaky associations with these other diseases should not affect confidence about suicide.	(F1) Conditions that might be influenced by changes in melatonin are relevant to suicide.	(C1) Associations with other diseases increase confidence in this association slightly.

TABLE 18.2.15

SUMMARY TABLE FOR SUICIDE			
	HOW LIKELY IS THIS ATTRIBUTE OF THE EVIDENCE UNDER:		
ATTRIBUTE OF THE EVIDENCE	"NO-EFFECT" HYPOTHESIS	CAUSAL HYPOTHESIS	HOW MUCH AND IN WHAT DIRECTION DOES THIS ATTRIBUTE CHANGE CERTAINTY?
Chance: highly unlikely.	Unlikely		Moderate increase
Upward bias: not suggested.	Possible	Possible	None
Confounding: a possibility.	More possible	Possible	No impact or slight decrease
Combined chance, bias and confounding.	More possible	Possible	Slight decrease
Strength of association: does not exceed plausible confounding or bias.	More possible	Possible	No impact or slight decrease
Strength of association.	Unlikely	Possible	Moderate increase
Consistency of four internal comparison studies:	Possible	More possible	Slight increase
Dose response monotonic in van Wijngaarden and Baris (Baris et al., 1996b) but not Johansen (Johansen & Olsen, 1998a).	Possible	More possible	Slight to moderate increase
Coherence: invisibility in national rates.	Possible	Possible	No impact
Experimental evidence.	Possible	More possible	No impact or slight increase
Plausibility: melatonin and depression links.	Possible	Possible	No impact
Analogy.	Possible	Possible	No impact
Temporality: not a problem.	Possible	Possible	No impact
Specificity of association. Other diseases	Possible	Possible	No impact of slight increase

18.3 IARC CLASSIFICATION AND CERTAINTY OF CAUSALITY

18.3.1 STATEMENTS OF INDIVIDUAL REVIEWERS

1 Reviewer 1 (DelPizzo)

2 *Degree of Certainty:* The human evidence, consisting mainly of one large
3 occupational study, tends to rule out chance as the explanation; but since many risk
4 estimates come from the same study, the possibility of bias or confounding in this
5 one study tainting the whole pattern of result must be considered. Nevertheless,
6 additional support for the hypothesis of causality is offered by the hypothesis that
7 melatonin suppression may contribute to depression and by the fact that other
8 associations have been evaluated as likely to be causal. The arguments against
9 causality are weak. In this reviewer's opinion, the combined pattern of the available
10 evidence is more supportive than dismissive of the hypothesis. Since the evidence
11 is so sparse that any conclusion must be tempered by large confidence intervals.
12 Reviewer 1's assessment is: "close to the dividing line between believing and not
13 believing" that EMFs increase the risk of suicide to some degree. For the purpose
14 of decision analysis, Reviewer 1 would use a median of 49 with a range of 20 to 60.

15 *IARC Classification:* "Inadequate." With no animal pathology evidence possible,
16 much more human evidence is required to make an assessment under these
17 guidelines.

18 Reviewer 2 (Neutra)

19 *Degree of Certainty:* The appearance of associations between suicide and high-
20 exposure jobs or estimated exposures within the large utility-industry cohort studies
21 is quite suggestive to this reviewer and is somewhat increased by reported
22 associations between the EMF mixture and melatonin levels, and some evidence
23 about the EMF mixture and depression as measured in depression scales. The
24 residential studies add only a very little to the impression, because of their designs.

25 The possibility (but not a particularly strong one) of confounding factors, and the
26 inconsistency between Johansen's (Johansen & Olsen, 1998a) reported dose
27 response and that of van Wijngaarden (van Wijngaarden et al., 2000), pulls
28 confidence downward. But, overall, this evidence moved the reviewer's confidence
29 moderately upward from the prior.

30 This reviewer's degree of certainty in causality is best expressed as "close to the
31 dividing line between believing and not believing" that EMFs increase the risk of
32 suicide to some degree. For the purposes of the policy analyses, this reviewer would
33 use a certainty score of 45 with a range from 15 to 70.




34 *IARC Classification:* The lack of definitive experimental and mechanistic evidence
35 and the inability to rule out confounding in the large cohort studies would make this
36 evidence "inadequate" to establish causality under the IARC scheme of
37 classification.

38 Reviewer 3 (Lee)

39 *Degree of Certainty:* Overall, the relative likelihood of a consistently weak positive
40 association increases the posterior over the prior. Some studies suggested dose
41 response. However, the reviewer's posterior is limited by the fact that confounding
42 cannot be ruled out, the heterogeneity of the studies, the lack of a clear dose
43 response in all studies, and the small number of studies that contribute to the body
44 of evidence. Hence, the posterior degree of certainty for purposes of the policy
45 analysis is a score of 45 and a range of 15 to 80 thus "close to the dividing line
46 between believing and not believing" that EMFs increase the risk of suicide to some
47 degree.

48 *IARC Classification:* The human evidence is weak where chance, bias, and
49 confounding cannot be ruled out. Also, the animal evidence is lacking and there is
50 no sound mechanistic rationale. Given this, the evidence could be classified as
51 "inadequate."

18.3.2 SUMMARY OF THE THREE REVIEWERS' CLASSIFICATIONS

CONDITION	REVIEWER	IARC CLASS	CERTAINTY PHRASE	DEGREE OF CERTAINTY FOR POLICY ANALYSIS THAT AN AGENT (EMFs) INCREASES DISEASE RISK TO SOME DEGREE
Suicide				0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
	1	3	Close to dividing line	
	2	3	Close to dividing line	
	3	3	Close to dividing line	

18.4 QUESTIONS RELEVANT TO DOSE AND THE STATE OF THE SCIENCE

The following questions address dose response and research policy issues.

TABLE 18.4.1

HOW CONFIDENT ARE THE REVIEWERS THAT SPECIFIC EXPOSURE METRIC OR ASPECT OTHER THAN 60 HZ TWA MAGNETIC FIELD IS ASSOCIATED WITH THIS DISEASE?	
COMMENT AND SUMMARY	IMPACT ON POLICY
(C1) Baris (Baris et al., 1996b) shows a statistically significant association with electric field but not with magnetic field, using a higher cutpoint than in the Baris (Baris et al., 1996a) study.	(I1) Some uncertainty about what aspect of EMF mixture is at work.

TABLE 18.4.2

EVIDENCE FOR THRESHOLD OR PLATEAU	
COMMENT AND SUMMARY	IMPACT ON POLICY
(C1) Baris (Baris et al., 1996b) suggest associations at levels that are experienced in the general population.	(I1) Implications for residential and occupational settings, if true.

TABLE 18.4.3

EVIDENCE FOR BIOLOGICAL WINDOWS OF VULNERABILITY	
COMMENT AND SUMMARY	IMPACT ON POLICY
No evidentiary base. Occupational studies are mostly daytime exposures, weak residential studies mostly nighttime.	None.

TABLE 18.4.4

CONSISTENT INDUCTION PERIOD OR REQUIRED DURATION OF EXPOSURE	
COMMENT AND SUMMARY	IMPACT ON POLICY
(C1) van Wijngaarden (van Wijngaarden et al., 2000) suggests recent exposure within a year is important.	(I1) Effect would not be persistent, if true.

TABLE 18.4.5

EMFs COMPARED TO OTHER RISK FACTORS FOR THIS DISEASE	
COMMENT AND SUMMARY	IMPACT ON POLICY
(C1) Similar to other modest risk factors.	No impact.

TABLE 18.4.6

RELATIVE RISK COMPARED TO THAT WHICH WOULD GENERATE 1/1000 OR 1/100,000 THEORETICAL LIFETIME RISK	
COMMENT AND SUMMARY	IMPACT ON POLICY
(C1) Suicide occurs at a rate of around 1/10,000. If this were increased by a factor of 1.5 over a 40-year work life or 70-year residential life, it would exceed the <i>de minimis</i> 1/1,000 and 1/100,000 benchmarks.	(I1) Could be of regulatory concern, if real.

TABLE 18.4.7

EVIDENCE FOR RACIAL OR CLASS DIFFERENCES IN EXPOSURE OR VULNERABILITY	
COMMENT AND SUMMARY	IMPACT ON POLICY
No evidentiary base.	No impact.

TABLE 18.4.8

ROOM FOR IMPROVEMENT IN QUALITY OR SIZE IN BEST EXISTING STUDIES	
COMMENT AND SUMMARY	IMPACT ON POLICY
(C1) Selection and exposure assessment are state of the art in these cohort studies. There is insufficient control for confounding, but it would be hard to obtain this information except in a prospective case-control study. A more refined assessment of induction period and examination of effect modification by age and other factors would be desirable.	(I1) Further studies could be done to resolve this issue.

TABLE 18.4.9

NEW STUDIES IN PIPELINE	
COMMENT AND SUMMARY	IMPACT ON POLICY
(C1) There are melatonin studies by Levallois in Quebec, Lee in California, and a depression study in pregnant women by Li in California, but no further suicide studies.	(I1) The pipeline studies are not likely to change current assessment much.

TABLE 18.4.10

HOW LIKELY IS IT THAT FURTHER STUDIES COULD RESOLVE CONTROVERSIES?	
COMMENT AND SUMMARY	IMPACT ON POLICY
(C1) Prospective case-control studies of suicide related to transmission lines and within the utility industry could resolve the confounding issue. (C2) It would be important to know if post-partum depression or depression requiring hospitalization is associated with EMF mixture exposures. (C3) Clarifying the mechanism (if any) for suicide might be relevant to mechanisms (if any) for other diseases, even though suicide itself is rare enough that it alone might not have much influence in a cost-benefit-driven policy analysis.	(I1) Further research could clarify this body of evidence considerably.

18.5 CONCLUSIONS ABOUT DOSE AND THE STATE OF THE SCIENCE

18.5.1 DOSE RESPONSE

1 The evidentiary base is scanty for choosing aspects of the EMF mixtures or
2 summary exposure metrics, determining biological windows of vulnerability, or
3 special vulnerabilities in subgroups of the population. Both Baris (Baris et al., 1996b)
4 and van Wijngaarden (van Wijngaarden et al., 2000) suggest the possibility of
5 effects from exposures found in the general population as well as in utility workers.
6 The interval from exposure to effect (if any) may be less than a year.

18.5.2 RESEARCH POLICY

7 Although suicide is not so common that it alone would drive a cost-benefit-oriented
8 policy, it has somewhat more mechanistic justification than the other conditions
9 reviewed (but still not a strong support). There is substantial room for improvement
10 in study design, and further study of suicide and serious depression (which is quite
11 common and, if implicated, WOULD drive utilitarian policy) could provide policy-
12 relevant information.